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THE SO-CALLED *MUS HIBERNICUS*.

BY THOMAS SOUTHWELL, F.Z.S.

PLATE IV.

At p. 36 *a* of their recently published 'Fauna of the Outer Hebrides' (as noticed in 'The Zoologist' for June), Messrs. Harvie-Brown and Buckley report the occurrence of this animal in the Outer Hebrides, and invite a consideration of its geographical range and the *status* of the creature itself. I shall be glad, therefore, to be allowed to give, as briefly as possible, some observations with regard to three individuals which appeared to me to agree with Thompson's *Mus hibernicus*, and which were killed in 1882 at Norwich, as already described by me in the 'Transactions of the Norfolk and Norwich Naturalists' Society' (vol. iii. p. 419).

On August 13th, 1881, an example of *Mus alexandrinus*, which I exhibited at a meeting of the Norfolk and Norwich Naturalists' Society, was killed at a wharf in that city; no others, so far as I am aware, were obtained at that time, but shortly after I was told that there were very uncommon Rats sometimes seen in that neighbourhood, and I asked (fully expecting that there were other Alexandrine Rats there), in the event of any being killed that I might be allowed to see them. On March 25th, 1882, my friend Mr. Utting sent me a Rat which in general appearance as to colour and texture of the fur, and elongated muzzle, very much resembled *M. alexandrinus*, but both in



size and length of tail approached *M. decumanus*: this I will call No. 1. On March 27th I received No. 2, which also resembled *M. alexandrinus* in having the upper jaw much longer than the under, but the total length of the head and body much exceeded that species, and the tail was shorter. The feet were strongly tuberculated; eyes, large, bright and black; general colour slate-black; hair long and coarse; a somewhat triangular or heart-shaped spot of white on the chest, and the fore feet white. No. 1 had not the white chest mark. A third specimen, received on May 9th, closely resembled No. 2, and had the white chest mark, but was even more robust. This last I sent to Mr. J. W. Clark, of Cambridge. Mr. Eagle Clarke's figures in the 'Fauna of the Outer Hebrides, which I am glad to hear are to be reproduced in 'The Zoologist,' might have been drawn from Nos. 2 and 3, above described.

But for M. de l'Isle's assurance that he could not induce *M. rattus* (which he considers specifically identical with *M. alexandrinus*) to breed with *M. decumanus*,* I should at once have regarded these Rats as hybrids between the Alexandrine Rat—an example of which had already been obtained from the same locality—and *M. decumanus*, and I am now strongly of opinion that such was the case; more than one generation had probably intervened in the seven months since the occurrence of the former species, and perhaps a further infusion of the native Rat would account for the greater similarity to the latter species. I am further inclined to this opinion from the examination of two Rats killed in the same neighbourhood in 1883, in which the apparent mixture of Alexandrine blood was slighter still. It may be that M. de l'Isle's experiments at interbreeding under more favourable circumstances would have proved more successful.

The sporadic occurrence of the recorded examples of the so-called Irish Rat, both as to time and locality, also tends, in my opinion, to show that the variety arose from the crossing of the Brown Rat with another species, whether it be *M. rattus* or *M. alexandrinus* appears to be a matter of indifference; probably both the Irish and the Orkney examples arose from a cross

* M. de l'Isle's paper will be found in the 'Annales des Sciences Naturelles' for 1865, pp. 173—222,

between *M. rattus* and *M. decumanus*, and in the Norwich case it seems likely that *M. alexandrinus* was the intruder.

For comparison I give below some corresponding measurements in the Common Rat (a very variable quantity, but I give Mr. Eagle Clarke's figures), of one of the Norwich specimens, of *M. alexandrinus*, and of Mr. Clarke's *M. hibernicus*.

	<i>M. decumanus</i> , Clk.	Norwich Rat.	<i>M. hibernicus</i> , Clk.	<i>M. alexandrinus</i> .
	In. lin.	In. lin.	In. lin.	In. lin.
Length of head and body	9 1	8 7	8 5	6 8
„ ears	0 9	0 8	0 8½	1 0
„ tail	7 1	7 1	7 5	8 2

Mr. Eagle Clarke's measurements of *Mus alexandrinus* seem to have been taken from an unusually fine animal; those given by me were from an adult male, the largest I have ever seen.

ON THE METHODS ADOPTED IN NEW ZEALAND FOR THE DESTRUCTION OF RABBITS.*

By COLEMAN PHILLIPS.

I WISH to place on record the facts connected with the outbreak of rabbit-disease in the South Wairarapa, and the methods by which the rabbit-pest was conquered in that district, as a guide for other places, especially insular lands of the globe.

Early in the year 1884, finding that our poisoning operations to reduce the pest were proving futile, and not caring to erect rabbit-proof fencing around my land to protect myself from my neighbours, I determined upon calling the settlers together for the purpose of simultaneously taking proper measures to grapple with the evil. The pest had been worst with me during the years 1881-83, but by 1884 I had personally managed to get it down so far as my own run was concerned. The settlers met upon the 19th April, 1884. A voluntary system of simultaneous action was resolved upon, and I am pleased to be able to say now, in the year 1889, that the pest has been thoroughly conquered over the whole district. The rabbits now only require watching, as they are watched in any country of Europe.

* From the 'Transactions of the New Zealand Institute,' vol. xxi. (May, 1889), pp. 429-438).

The measures the neighbours adopted were simultaneous poisoning with phosphorized grain and the simultaneous turning-out of the natural enemy, chiefly the ferret. A few of us had been previously poisoning, and breeding and turning out ferrets, and some of us the domestic cat; but the Hon. Mr. Waterhouse was the first to turn out ferrets, some four or five years previously. In 1886 Mr. E. J. Riddiford preferred turning out stoats and weasels upon the land, and I think he turned out two to three hundred (one hundred stoats and two hundred weasels). From 1878 to 1888—say in the ten years of the pest—the measures taken, therefore, to grapple with the evil were hunting and shooting with dog and gun, poisoning with phosphorized grain, and the turning-out of cats, ferrets, stoats, and weasels. Seeing that we were turning out the natural enemies, I induced the settlers not to make use of traps. At the present moment so little is this question understood that a reference to Mr. Bayley's (the Chief Rabbit Inspector of the colony) Annual Report for 1888 will show that the Government and every Rabbit Inspector are willingly allowing the use of traps in every other district of the colony. Of course this is almost fatal to the natural enemies. The use of traps must be absolutely prohibited. With regard to rabbit-proof fencing, I always thought it a weak thing, and I would have nothing to do with it. I preferred to reduce the pest upon my neighbours' runs as the best method of protection for my own land.

Time ran on; the rabbits were disappearing fast, the lands were becoming clear; and now a rather great factor of suppression appeared—I suppose I may say the greatest of all—*viz.*, disease—bladder-worm or tape-worm of the dog, concerning which the facts are as follows:—Early in the year 1886 I had noticed that my rabbitier's pack of dogs were looking miserably-poor, half-starved, mangy skeletons. I spoke to the man, and told him that I could not allow him to keep his dogs in that condition. (I had now only one pack of dogs employed: formerly, in 1882, I had four. I think I sent home about one-quarter of a million skins during the pest.) I had previously noticed that a neighbour's pack of dogs were in much better condition, and that neighbour's rabbitier had told me that he gave his dogs areca-nut to relieve them of worms. I advised my rabbitier to give his dogs the same medicine. And, although

Professor Thomas, in his late report, tells me that I did wrong in giving the dogs this medicine, yet must I, from practical experience, say that to it, and the consequent dissemination of pieces of the tape-worm all over the run during the last two years, can I alone attribute the thorough infection of my land with bladder-worm or rabbit-fluke. The diseases of liver-rot, scab, and lice also appeared. The few rabbits that I have remaining are now nearly all diseased. I may perhaps have been wrong in administering monthly doses of the medicine—two-monthly doses would have been better; but that the mistake was not fatal is proved from the fact that the run now is thoroughly infected with the disease. I therefore still advise runholders in the South Island to each use a pack of dogs, feed them upon raw rabbit during the week and boiled rabbit upon Sundays, and give them two- or three-monthly doses of arecanut. For I must respectfully ask scientific men, like Sir James Hector and Professor Thomas, to concede a little to practical experience in this special matter, seeing how great the evil really is to be contended with. (A reference to Professor Thomas's report will show that that gentleman lays great stress upon the efficacy of the winter poisoning in my district. All I can say is that the winter poisoning did us very little good. Under it the rabbit-pest was as bad as ever.)

About eight or nine months since my rabbitier informed me that he had applied to the New South Wales Government for the reward offered for a proper method of suppressing the pest in Australia. His suggestion was, infection with venereal. I did not believe in this, and considered in my own mind that the disease I had upon the run would be a better thing for Australia. We often discussed the matter amongst ourselves. The rabbits had disappeared like magic. Surely the remedies we had taken would apply to Australia. As to the ferret, I was not at all satisfied with its action. It did not appear to have done nearly the good that I had anticipated. The cats were doing as much good, I thought. I placed as little reliance upon the ferret as I did upon poisoning or rabbit-fencing. The ferrets died off rapidly from distemper. They did not appear to at all increase in sufficient numbers to cope with the evil. Although a gill-ferret littered in large numbers, yet the young ones did not appear to survive. But they had done a certain amount of good.

(Consequently I still advise their use. I would say this, however: that they must not be relied upon in the South Island for the high snowy lands.)

I therefore determined to apply for the reward myself, and I sent one of the diseased rabbits to Sir James Hector to ask his opinion. That gentleman replied favourably. He had previously received two specimens of the disease from the Wairarapa, and he had himself seen a virulent disease of some kind amongst the rabbits in North America. Sir James had previously spoken to me about this disease that he had observed, and he therefore made up his mind definitely to identify it, upon receiving this third specimen from me, with the North American disease. Professor Thomas differs from this view, and says that the tapeworm is not the same—that it is totally distinct. It may be so, and Sir James Hector may be wrong. Our rabbit is not the same animal as the jack-rabbit of North America—a sort of hare; but, nevertheless, I wish to record my thorough appreciation of Sir James Hector's services in identifying the disease so far as he did. Sir James did not know which animal acted as host in passing the particular worm that is here. I said it was the dog. We had all along observed it coming from the dog. Neither Sir James Hector nor Professor Thomas thought it could be the tame dog, although Professor Thomas was careful to express no decided opinion. It will be observed upon reference that Sir James Hector thought it came "probably from the wild dog and cat." Of course we have wild dogs, and I have turned out many cats, which have thriven remarkably well; and these may have started the disease: but the tame dogs certainly do carry it on, and they will spread it readily in the South Island. The cats may also spread it, as there are at least a hundred cats upon my run now. The disease only requires to be started upon the runs in the south or elsewhere to perform as good work as it performed with us in the Wairarapa.

My letter to the Colonial Secretary of New South Wales, applying for the reward, found its way into the newspapers of Australia, and immediately I was told by many of my fellow-settlers in the Wairarapa that the disease was no new thing; that some of them had observed it two, four, even six years ago; that they had it upon their runs, and other diseases as well, such as liver-rot, mange, scab, and lice. The generality of them said

the disease (bladder-worm) was no good, and wondered at my taking any notice of the matter. Many of them, and the general number of rabbit-men and Maoris, considered that the bladders were caused by gunshot wounds. Even the other day, when I was bringing a good specimen of the disease down to Sir James Hector, the Maoris, clustering round the box, remarked, "Ah! that rabbit was wounded." All this evidence points to the one fact that for six years past this disease has been silently at work upon the runs of Wairarapa, and to it may be attributed, just as much as to the winter poisoning or the ferrets, the further great fact that in the Wairarapa the rabbit-pest has been conquered. (I attribute the subjection of the pest to the three things acting in combination.) The mange, itch, or scab had also been observed upon my own and the neighbouring runs; but the rabbiters considered that such rabbits had been scorched or badly burnt in the many fires lit to clear off the scrub. Liver-rot had also been observed, especially upon Mr. Tully's run—a run celebrated for the bad state of the rabbit-pest there, but which I am happy to say is now almost clean. Prof. Thomas's interim report does not say whether liver-rot is attributable to bladder-worm—or rabbit-fluke, as Sir James Hector named it: I fancy it is.

Now, let us leave detail and go into principles. Let us see what this bladder-worm really means. Let us take an atlas of the earth, and inquire into the reasons why the four great continents of Europe, Asia, Africa, and America are free from the rabbit-pest, and why it is so bad in Australia and New Zealand. If my course of reasoning is found to be sound, then, surely, M. Pasteur's proposed mode of suppressing the difficulty with cholera-microbe solution will be found to be as absolutely useless as our winter poisoning, and very far indeed removed from the right method of cure. I use the words "absolutely useless" in this sense: that it will be no good M. Pasteur sweeping off the rabbits by millions if they breed up again, and have to be again swept off. Under the winter poisoning we are sweeping off the rabbits in New Zealand at the present moment at about fifty millions a year.

And, first, it will be remembered by members of this Institute that last year I read a paper upon "A Common Vital Force." The reasoning in that paper has furnished me with matter for

clearing up the present question. My argument is as follows—and Professor Thomas, before sending in his full report, will do well to think over what I am about to say, and to amend his summary of conclusions at the end of his interim report lately presented to Parliament:—

The rabbit appears to have started in Africa. Negro legends all point to it as the cunning animal, just as our legends point to the fox. From Africa it passed to Asia and Europe, as European lands emerged from the sea. (I consider Africa the oldest continent, geologically, and the negroes the oldest race of men, ethnologically.) From Asia it passed into America, or the jack-rabbit there may have been in America coterminous with the rabbit's existence in Africa or Asia. With the rabbit went the stoat, weasel, ferret, cat, dog, fox, wolf, and other natural enemies. I am speaking now of many thousand years ago—long before men ever appeared upon the face of the earth, but still while the four present great continents were continents, and Australia and New Zealand isolated.

And these animals, which we call the natural enemies, were specially sent by nature to watch the rabbit and prey upon it, and prevent its excessive increase. Thus the common vital force always acts. One order of creation is not allowed to take possession of the earth—another checks it; and so the balance of utility is preserved.

Sir James Hector, thinking as I think, stated some months since that soon there would be no rabbits in New Zealand. I would point out to Sir James that in saying that he has gone too far. Nature checks excessive increase, it is true, but nature does not willingly allow any one order of creation to be exterminated. On many an estate at home there will still be found, after a thousand years of experience, the fox, the stoat, the weasel, the dog, the cat, and the rabbit side by side. Trap off the ground-vermin, as it is called, and the rabbit will rapidly increase; so that any idea of our depending entirely upon bladder-worm or any disease must be abandoned. The rabbit will never be exterminated now from the lands of Australasia. Nor is it advisable for us to exterminate it.

But there is a great distinction between the rabbit as an animal and the rabbit as a pest. Nature carefully makes this distinguishment in all living things. Only those things came to

this planet of use to it, as its climatic conditions proved favourable to their reception, and each thing carried with it its own check from excessive increase. The general check (this course of reasoning supposes space to be filled with germs, and other planets inhabited) is a worm of some kind. For when any living thing becomes too thick—be it man, sheep, rabbit, pig, horse, ox, or other animal—immediately the land becomes infected by the excessive excreta of itself or its natural check. I rather fancy that its own excreta first starts the check, which rapidly spreads by means of the host. In the sheep we see it when we say that the land becomes sheep-sick. Upon such lands the hoggets get the lung-worm, and die off. So that, supposing we tried our best to keep but one animal running constantly upon one set of lands, the end would be that that animal would dwindle down to very few indeed. In the case of the rabbit, its own intestinal worms, or the intestinal worms of the natural enemy, are always ready to infect the lands and guard those lands against entire occupation. And so determined is nature to do this, that away up in the arctic regions, where the rabbit, jack-rabbit, and hare can go in comfort, being furred animals, there is it followed by the stoat changed into an ermine. The stoat puts on a warmer coat, and follows the rabbit even to the poles. For that reason stoats are alone to be relied upon by our Government here for suppressing the plague in the high snowy lands of the South Island.

Now let us look at the atlas, and see the position of Australia and New Zealand. What is it? Disconnection from the four great continents. Here there were neither rabbits nor any natural enemy (I allude to the end of the secondary period in geology, when Australia is supposed to have been separated from the mainland). The land was clean from either. Lately we have brought the rabbit, and, finding no check either against itself or against it as a pest, it rapidly developed into the pest form. Neither ferret, stoat, weasel, fox, nor wolf was here to infect the lands with the tape-worm eggs, and so the rabbit throve and multiplied. The dog alone was here, and in the Wairarapa the dog appears to have carried out nature's law of check. My accidentally giving the dogs areca-nut but assisted nature's law.

Of course, I do not say that the tape-worm I use is the worst

form of tape-worm. There are two hundred and fifty different kinds of tape-worm, and I have no doubt that the tape-worm of the fox and wolf is a far more virulent disease than the tape-worm of the dog. But then I do not like to introduce such animals into Australasia amongst our sheep. The Hon. Randall Johnson tells me that a proposition comes from Africa for us to use here the civet-cat and the meer-kat. (The civet-cat is closely allied to the aard-wolf.) But, again, I say that I do not like introducing here more ground-vermin than are absolutely necessary. I find that I have succeeded with the dog, cat, ferret, stoat, and weasel. What necessity is there to introduce anything further yet awhile? I feel almost sure that these animals will perform the work for Australasia. At any rate they should be tried before introducing any of the other animals. We never know how the *feræ naturæ* develop in these new lands. These require *their* check just as much as the rabbit requires its check: hence my aversion to their introduction. Had the dog, cat, and ferret been capable of performing the work of suppression, I would never have introduced the stoat and the weasel into the Wairarapa. At any rate, if we have to concede to the full extent of the round of nature's law, let us wait until population becomes a little more dense with us, to impose the proper check of man.

From all this it will be seen how totally wide M. Pasteur is from the truth, and how little dependence can be placed upon purely scientific reasoning in dealing with this question.

That the rabbit multiplies itself rapidly upon insular lands of the globe is seen from two instances recorded in history. In A.D. 1 the inhabitants of the Balearic Isles petitioned the Roman Emperor Augustus for assistance in subduing a rabbit-pest there. Two legions of the Roman army were sent to get the plague down. It is evident now, from my course of reasoning, that these islands wanted the natural enemy.

Also, in the case of one of the Canary Islands, or Teneriffe. Prince Henry of Portugal, I think, sent some rabbits to one of them, and the inhabitants had very great difficulty in subduing the pest. I am a little uncertain as to the facts in this case, but I remember meeting with it some time since, accidentally, in the course of reading. This case, and the former one of the Balearic Isles, and New Zealand and Australia, are exactly alike.

A narrow view of this question is therefore quite inadmissible. We can but look at it from the point of view I suggest—*viz.*, with an atlas of the globe before us. Hitherto we have regarded the matter too narrowly in New Zealand, and M. Pasteur's remedy, strange to say, is too narrow also.

With regard to rabbit-fencing: I do not object to rabbit-fencing, but I consider it a waste of money. The best and most sure fence is the egg of the tape-worm upon the grass. The calculation for each dog is as follows: $1 \times$ by 100 tape-worms, \times by 100 segments, \times by 1000 ova.

As to the expense of the remedy, the beauty lies in its cheapness. Supposing the owner of each run in the South Island got but two of my diseased rabbits, and fed those rabbits to two hungry dogs in his pack, and then went steadily hunting over his land, the moist lands would quickly become infected with the tape-worm eggs. The rabbits would eat them and get fluked, and soon the whole pack of dogs would be infected. The dogs would then infect the whole of the lands. Whether the ferrets, stoats, and weasels also carry the worm about I cannot say. I firmly believe they do; but I have all along been quite certain that the tame dog does so, and I think the cat also. Neither Sir James Hector nor Professor Thomas are able to tell me anything about this; so I can but be guided by my practical experience. This is why I object to rabbit-fencing. I wish free open fences for the dog and natural enemy to disseminate the tape-worm ova.

With regard to the danger of the sheep becoming fluked, I have never heard of a single case of the sort in the Wairarapa during the six years the disease has evidently been silently at work amongst the rabbits. Nor do I think that the bladder-worm of the rabbit can possibly infect the intestines of the sheep. Each order of nature has its own check. This can be seen from the fact that there are some two hundred and fifty different sorts of tape-worm. The rabbit might carry the proper sheep-fluke about in occasional instances, but I do not think that the sheep could possibly carry the rabbit-fluke about. At any rate, my sheep have been running upon my badly-infected, rabbit-fluked lands, and no instance of death has yet occurred.

I need scarcely point out the severity of any tape-worm disease. A few years since seven hundred thousand pigs died

near Chicago from trichinosis: last year a score of thousand hoggets died from lung-worm in the southern portion of this North Island of New Zealand; millions of sheep die in England from sheep-fluke. These are but instances of the severity of nature's laws. And nature's proper laws are continuous; not like M. Pasteur's remedy, or our own winter poisoning. How well do we know here that the rabbits grew proof against the poisoned grain, and refused to take it! So will the rabbits grow proof against cholera-microbes. Even a few fowls in each hen-roost always escape the ravages of chicken-cholera. Again, there were, and are still, many places in the South Island where we could not lay the poisoned grain. This escape from poison and disease, and these inaccessible places, yearly afford bases for the rabbits to breed up again. But there is no escape from bladder-worm or liver-rot.

With respect to the time the disease takes to effect the death of the rabbit, Professor Thomas mentions thirteen and twenty-one days after infection. We have always thought it took longer, but Professor Thomas thinks that he can make the disease even still more fatal. This is good news; but I do not think there is any necessity for it to be more fatal than it is. My run is clear now from the pest. I keep but one rabbit and a pack of dogs over twelve thousand acres, and he catches about twenty-five rabbits a week. He could look after twenty thousand acres just as easily as twelve thousand. (I do not think his time thrown away in regularly going round the run. He saves his wages in other directions.) I am, however, indifferent what disease is selected, provided one of nature's true remedies is applied. As to any disease like cholera suddenly sweeping off millions, I do not believe in its applicability to our present circumstances. Too much virulence would do harm.

In the use of so many dogs there is, of course, a danger of some dogs going wild. I should recommend the Government to publish the resolutions the settlers arrived at in my district, in 1884, upon this question. We are now through the rabbit-pest, and I do not think the wild dogs have killed a thousand sheep during the last four years over a million acres. Still, there are a few dogs gone wild in the bush, which we occasionally hear and see; but these can easily be got if the search for them is properly gone about. Prevention in this matter is better than

cure. I prefer this danger to the introduction of the fox or wolf tribe.

There is some talk of this rabbit-disease attacking man in the form of hydatid. So it will. Hydatid from sheep attacks a few persons in Australia. Hydatid from the dog attacks a few of the Iceland people. I do not think much of these things. People cannot give up eating rabbit or mutton, or keeping dogs. To do that is the true remedy for the alarmists, and it is impracticable.

I would repeat that Professor Thomas does not draw the same conclusions from the mode of conquest of the pest in the Wairarapa that I draw. The winter poisoning had little or no effectuality. The ferrets worked well only in isolated places; in other places they would not live at all. But the three things acting in combination—*viz.*, the poisoning, the natural enemy, and these diseases—effectually did the work of suppression. The poisoning swept off the millions; the ferret, cat, stoat, and weasel ate the young ones left; and then this bladder-worm and liver-rot attended upon all and completed the cure: but the poisoning itself was of little good. Herein it will be seen that practical experience is better than scientific theory. I hope Mr. Thomas, after reading this paper, will amend his interim report in the proper direction. It is not because the tape-worm here may not be exactly the same tape-worm that sweeps off the jack-rabbit in North America that Sir James Hector was wrong in the application of the general principle. That principle is that the excess of every order of life is held in check by some particular worm.

On the other hand, I must say that I saw far more from my ten years' practical experience in reducing the pest than Sir James Hector or Professor Thomas could tell me about it. Combining these things with M. Pasteur's proposals, I must be excused for doubting scientific conclusions. Sir James Hector proposes the introduction of the kit-fox here: I think such a step would be wrong and unnecessary yet awhile. My opinion is that the wolf and fox tribes are the natural enemies of the sheep. We are clear of sheep-fluke now in Australasia, and I have no wish to introduce it. The bladder-worm hydatid of the rabbit and sheep hydatid are luckily two distinct things.

With respect to complete rabbit extermination, I wish to say

that it will be most inadvisable to attempt such a measure ; and if it is attempted in Australia it will not succeed.

I am told that I am making too much of these diseases, and that specially favourable circumstances aided me in suppressing the pest in my own district. Those who say this do not see the importance of the principle contended for. So great is that principle that I have offered to reduce the rabbit-pest to a minimum in the South Island of this colony if I am allowed four years in which to do it. For that was the time it took me to reduce the pest in the South Wairarapa.

ORNITHOLOGICAL NOTES FROM NORFOLK.

By J. H. GURNEY, JUN., F.Z.S.

IN continuation of my former Reports (p. 134), the following are the most important notes made during the first half of the year 1889:—

On Jan. 9th a Sand Grouse, *Syrrhaptes paradoxus*, was taken alive at Southrepps, and placed by my father in a cage with another previously obtained. The beak and skin round the eyes in spring lost their greenish tone, and by June had acquired a blue tint, which was brightest when the birds were excited.

On Feb. 5th Capt. Applewhite sent a Dabchick choked by a "Miller's Thumb," *Cottus gobio*, from Pickenham: the fish was firmly fixed with the tail projecting, in which position Mr. Gunn has since preserved it with the bird. On Feb. 18th I procured a Cormorant at Cley, where another was shot on the 14th, and a third shortly before that. This is not a very common bird in Norfolk. Mr. Southwell and I saw two on Hoveton Broad as late as May 16th.

About the beginning of April it was remarked that a duck at Keswick, in rather more than half male plumage, was evidently supposed by its companion—a pure-bred decoy-drake—to be a male, and accordingly he commenced a system of bullying, while his own mate looked on placidly, the supposed drake all the time fleeing from the pursuer, proclaiming her sex with loud "quacks." On April 19th, at Brooke, a Woodcock was sitting on four eggs in a large wood of 163 acres, composed entirely of oak, with an extensive undergrowth of stub. It was so tame

that a sketch was made of the sitting bird in the presence of four witnesses. The nest was in the midst of a spreading oak stub, and was composed entirely of the leaves of this tree with a few of the Woodcock's body-feathers, and measured inside six inches across; the eggs all pointed towards one side, and it was noticed that the flank-feathers of the bird were much extended when she was sitting.

On May 12th a large flock of Dotterel, *Eudromias morinellus*, appeared on Yarmouth Denes: Mr. G. Smith thinks he saw at least a hundred, and some of them were very tame, permitting a near approach. About May 13th Ospreys were shot at Weybourne and Salthouse, and soon afterwards a large hawk—supposed to be another Osprey—was seen at Hempstead. On May 22nd Mr. W. E. Baker showed me a Hawfinch's nest containing four eggs; and on further search we discovered, in the same wood, another nest of this species containing five eggs, besides two unfinished nests and one of last year. It was gratifying to find these rare birds so plentiful, and we left all the eggs untouched, to the gratification of the old Hawfinches, who were too shy to do more than peer at us from a distance. One of the nests was in a whitethorn, one in an elder, and three in maple trees, at altitudes varying from ten to twenty feet. In one part of this wood there is a great deal of grey lichen growing, chiefly on maple, which is possibly the attraction to the Hawfinches, for I do not remember to have seen a nest which had not some lichen in it. Many Chaffinches nest in this wood, as does also the Tree Sparrow, *Passer montanus*, and Chiffchaff, which last is, strange to say, a rare bird in Norfolk. Even such a veteran collector as my friend Mr. Norgate has only met with a few nests of the Chiffchaff in the course of a long experience. On the same day (May 22nd) Mr. Baker proposed a visit to a small wood of spruce fir and oak, where there were about fifty Heron's nests: I climbed up to several of them, all of which contained young, and found their chief food to be eels. In one nest there was an eel eighteen inches long, in another a roach. Some of the nests were more than four feet in diameter; as they were decidedly odoriferous, I only stayed by them long enough to observe that several contained four occupants, and others only three. The most cup-shaped were fully six inches deep, but others were mere shallow platforms, yet tightly woven. No doubt they become

much flatter after the young are hatched. Below the second Heron's nest which we inspected was a Sparrowhawk's nest, containing five eggs, the distance between the two being not more than four or five feet. There were no remains of fur or feathers about the Hawk's nest (which was not a small one), and merely some of its own down in the lining. A little further on we found a Jay's nest, and three nests of the Carrion Crow, a bird which is getting very scarce in most game-preserving districts. One was in an oak tree, and two of the young Crows, apparently oppressed by the heat (for it was a very warm day), were craning their long necks over the edge of the nest with wide-open mouths, which we could see from below were bright red; the second nest was unfinished, and the third held two young Crows, still quite blind, with disproportionately large red mouths. The cup of this nest was four inches deep and a foot across, lined with wool, a piece of black cloth, and two pieces of newspaper; it was built on the flattened top of a leaderless spruce fir, thirty feet high.

Mr. Baker informs me that he has every reason to believe that the Curlew has nested more than once on the Sandringham estate, where there is a good tract of ling strictly preserved by H.R.H. the Prince of Wales. One of the keepers, named Salmon, found a nest with eggs there. Salmon knows the difference between the Norfolk Plover, or Stone Curlew, and *Numenius arquatus*, and is aware that the former only deposits two eggs, and does not lay them in the ling. This is the first intimation received of the Curlew nesting in Norfolk.

On June 28th a keeper showed me the nest of a Reeve, *Machetes pugnax*, which he had found in the early part of May, and which then contained four eggs. Unfortunately at the time of my visit there were only the broken shells, indicating, as he supposed, the work of a Marsh Harrier, *Circus æruginosus*, which had come after his decoy-ducks. As we were leaving the place we stumbled on another nest with four eggs, beautifully hidden in green rush-grass, nowhere more than a foot high. The eggs, which were very handsome, all pointed inwards, their four small ends meeting. The diameter of the nest was 3.3 inches, which is less than that of a Redshank; it was constructed of dead bents of *Eleocharis multicaulis*, mixed apparently with *Triglochin palustre*. For this identification I am indebted to Mr. A. H. Evans, who knows all the plants of the locality. A "run" made

by the old bird led almost up to the nest, from a distance of twelve yards, and on the other side there was another "run" not so long. I have seen many similar "runs" made by Redshanks and Water Rails. As I was anxious to identify the eggs beyond all doubt, we retired to some distance, and after some time had the pleasure of seeing the Reeve return to the nest.

THE HABITS AND HOME OF THE WANDERING
ALBATROSS, *DIOMEDEA EXULANS*.*

By A. REISCHEK, F.L.S.

THIS noble bird may justly be called the king among the sea-birds. Many times during my sea-voyages have I admired its flight and easy sailing over the waves, as it followed our vessel, hundreds of miles from the nearest land. Its power of flight surpasses that of most birds, and is easily accounted for by the unusual development of the muscles of the breast and wings, the latter being equal to, if not stronger than, those of the eagle. It is worthy of remark that the quills of the wing are spread or brought close together according as the bird is rising or falling in its flight. The steering is done not with the tail alone, but also with the broad webbed feet. These, when a straight course is being followed, are stretched out, and nearly concealed under the tail; but when a quick turn is required their position is altered, and the webs are spread in such a manner as to greatly assist the bird in turning. When there is little wind and the ocean is calm, Albatrosses have great difficulty in rising from the water; when there is a swell they run along the water and rise with a wave. When alighting, on nearing the surface they bend the head back, curve the wings upwards, beating the air with numerous laboured strokes, then, straightening their feet, they let themselves fall. They are fast swimmers, but cannot dive. Their food, which consists chiefly of some of the lower forms of marine life found floating on the surface of the ocean, they scoop up with their bill in the same manner as Ducks.

* From the 'Transactions of the New Zealand Institute,' vol. xxi. (May, 1889), pp. 126—128.

I had long been anxious to visit their breeding-haunts, but had no opportunity of doing this until January, 1888, when I was afforded the privilege of accompanying the Government steamer 'Stella' on her yearly cruise among the islands to the south of New Zealand. After visiting Stewart Island and the Snares, the steamer's course was directed towards the Auckland Islands, and on the 25th January we anchored in Carnley Harbour. Having ascertained from Captain Fairchild that the vessel would not leave until the following evening, I at once prepared for an expedition to the hills, on which I was informed that Albatrosses were then breeding; and at 4 o'clock in the morning the chief officer put me ashore. The first creatures I met were several Sea-lions sleeping in the long grass, over which I almost fell. They gave discontented growls at being disturbed and driven from their lair, sitting up on their haunches and gazing at the intruder with their large eyes, showing their white canine teeth all the time. Moving onwards I had a dreadful scramble through dense low scrub interspersed with holes and swampy places, but at last I gained the hills above. My exertions caused me to suffer greatly, being far from well through overwork on the west coast of the South Island. After climbing over hills for about three miles I came to a slope where a colony of Albatrosses had established a breeding-place. The birds were scattered about among the tussock-grass, sitting on their nests, and from their white plumage could be easily distinguished from the vegetation at a great distance. I found that their nests are always placed on sloping ground, and always on the most exposed side of the hill. They are composed of earth and grass cemented together, and are built in the form of a cone. They are usually about two feet in diameter and about eighteen inches high. Outside they are surrounded by a shallow drain, intended to carry off the surface-water. Within is placed a single egg. This is white, with a few brown spots on the broad end, and measures about 5.5 inches in length by 3.1 inches broad. In most cases I found the female on the nest, the male bird standing close to her, and occasionally feeding her. I noticed that sometimes the male relieved the female, but they never both leave the nest until the young one is able to defend itself against the Skua Gull, *Lestris parasiticus*. This rapacious bird devours every egg or nestling left unprotected. While

taking the measurements of the first nest I came to I laid down the egg beside me, when a Skua darted at it and destroyed it. They were so bold that they frequently came close enough for me to hit them with a stick.

On my approaching an Albatross's nest, the old bird seldom left it, but set up a croaking noise, clapping its mandibles together and biting at the intruder. After turning it off and taking away the egg, it returned and sat on the nest as before. The eggs were quite fresh on the 25th January, and good for eating when fried. There appears to be a difference in the time of laying at the different islands, for at Campbell Island, considerably to the south of the Auckland Islands, their eggs were nearly all hatched by the end of January, while at Antipodes Island, a little to the north again, they had hardly begun to lay at the beginning of February.

The Albatross takes five years to become fully mature, and in each year there is a slight change of plumage. The young, which are hatched in February, are covered with snow-white down, and a beautiful specimen in this stage exists in the Otago Museum. In the following December they lose their down, and the plumage is of a brown colour, with white under the wings and on the throat. In the second year the plumage is the same, except that there is more white on the throat and abdomen. In the third year there is still more white, although mixed with blotches of brown, the under parts, however, being nearly all white. The wings and tail remain dark brown. In the fourth year they very nearly acquire the full plumage. The male is white, with a few very fine dark specks, except the wings, which are dark brown. In the fifth year they reach their full growth, and the mature plumage is displayed—white, with blackish brown wings. The measurements are as follows:—Total length, from the tip of the bill to the end of the tail, 3 ft. 3 in. Bill, 7 in. Tail, 7·25 in. Whole wing, from 4 ft. 10 in. to 5 ft. 10 in.; primaries, 1 ft. 8 in. Whole leg, 1 ft. 10½ in.; tarsus 4·5 in.; middle toe, 7 in. The female is much smaller, as can be seen at once from the specimens exhibited.

Notwithstanding the ease and grace of the Albatross on the ocean, on the land it is a most clumsy and helpless bird. Its walk is slow and waddling, like that of a Duck, and it cannot

take flight from a level piece of ground. It is for this reason that these birds have been gifted by nature with the instinct of making their nests on the slopes of mountains, for by running down-hill, and labouring hard with their wings, they can at last acquire momentum sufficient to raise themselves in the air. Once there they exhibit their true power, and are seen to the best advantage.

THE GREAT BLACK WOODPECKER IN ENGLAND.

By REV. CLEMENT LEY.

[In our review of 'Notes on the Birds of Herefordshire,' collected by Dr. Bull, which appeared in 'The Zoologist,' 1888 (pp. 277—280), we noticed a statement to the effect that "there could be no doubt of the Great Black Woodpecker having been observed on several occasions in Herefordshire," and quoted (p. 279) the evidence on this subject adduced by the Rev. Clement Ley, of Ashley Parva, Lutterworth, Leicestershire. Mr. Ley having since published a long letter on the subject in the 'Hereford Times,' intended as a reply to certain critics who seem to have imagined that there was some mistake in the identification of the birds seen by him, we reprint this letter for the benefit of our readers who may not have seen it, omitting only, for the sake of brevity, three paragraphs which are not material.—ED.]

On the subject of my own observations of this bird in England, I have not for some time asked for space in the columns of the 'Hereford Times.' The causes of my silence have been partly that no re-statement of those observations would of itself add force or credibility to my first statement; partly because I have entertained the hope that some other naturalist would in course of time have been able to confirm my evidence by his own observations; and, after all, one single piece of positive evidence from any thoroughly capable and veracious observer will outweigh many pages of negative criticism. I was not anxious to appear in any hurry to reply to any hostile remarks. From the moment that I first heard the note of this bird in England, and still more from the time that I first saw the bird, I anticipated even more general disbelief and more severe denunciations than my statements have in fact received. The man who has been so fortunate, or so unfortunate, as to see a prodigy not once, but twice, should either hold his peace or should expect to meet

with such unbelief as I myself should perhaps bestow upon him, were he other than myself, or not an intimate acquaintance. So that my critics have perhaps, in the main, done as they would be done by. I shall in this letter refer to no criticisms of 'The Birds of Herefordshire,' the work of my old and valued friend Dr. Bull, except in so far as these criticisms relate to certain observations of mine therein recorded.

* * * * *

I adhere to every statement made by me concerning English and foreign birds. But it may be due to some readers that I should add a very few particulars concerning my observations of *Picus martius*, and one brief explanation of a statement, disbelieved, concerning *Jynx torquilla*. I am not going to weigh the evidence of Capt. Mayne Reid (Zool. p. 196); and I know nothing of what befell Mr. D. R. Chapman at Belmont, or of the reasons why he seems to be slightly ignored.

It is through necessity that this letter is almost entirely egoistic. The only witnesses who in my company had an excellent view of *Picus martius* in England were Mr. E. W. Du Buisson, M.R.C.S., of Castle Street, Hereford, who permits me to state that he has a vivid recollection of the occurrence, and believes he can still point out the tree in Ruckhall Wood in which we watched the strange visitor,—and in 1876 my daughter, who retains a similar recollection of this bird as we saw it at Mount Edgecumbe, in Devonshire. But although these witnesses were at those dates keen young naturalists, and well acquainted with the appearance and the notes of the three well-known British Woodpeckers, they were each at those respective dates only about ten or twelve years of age,—too young, perhaps, to add much weight to my testimony, in the thoughts of my critics. I heard the cry of *Picus martius* twice, unmistakably, at Pengethley Gorse, Ross; once, unmistakably, in the parish of Fownhope; once, dubiously, distant and uncertain, on the Little Doward. For myself, I possessed the faculty, which I still retain (though my ornithological rambles are probably over), of never forgetting the note of any bird which I had once heard; together with the barbaric habit of tracking silently, at home or abroad, through brambles and leaves, those animals whose voices I had heard, but not as yet identified, until this habit became no longer necessary. But there is one barbarous deed which I never committed, though

very frequently carrying a gun. I never slew a very rare though probably indigenous bird. It might be well, if it were possible, to extirpate such writers as the 'Athenæum' critic of Dr. Bull's work, the advocates of the ceaseless pop-gun,—men destitute of any enthusiasm for living nature, whose eyes and thoughts do not travel beyond the four walls of a museum bird-room; men who publicly state that they will believe nothing until they see the bleeding form of a fresh-killed specimen; men, the polar antitheses (I trust Prof. Huxley may not see my adjective) of that great observer who, having killed a Crossbill partly by accident,—in, I think, the Shrewsbury Garden,—could not for years persuade his tongue to tell the sad story. No Wild Birds Protection Acts, none of the intelligence of those few landlords who strenuously preserve to the best of their ability all rare wild birds on their property, can, I fear, be a match for these antagonists of Nature. I fear that my words will do nothing to cure this evil. I believe, however, that what has twice happened will probably happen again. If it be true that all the evidence with respect to the occurrence of *Picus martius* in England previous to my own sight of this bird is unsatisfactory, then certainly what I saw is to me wonderful. But it is not so wonderful as it might appear to other people. Possibly not one man in a million residing in England can recognize the note of *Picus martius* (and had I not recognized this I should not in England have seen the bird). Selecting the men who would recognize the note, I am inclined to question whether one of them is likely to have possessed those habits and that mode of life which led me to recognize the bird. Still, we have to deal with generations, not living men; and the question of antecedent probabilities is complex, and scarcely calls for algebra here.

One of your correspondents, whom I will treat as anonymous, refers to me as writing romance. Had his scientific reading been a little more extensive than it has been, he would not, perhaps, have used this term. As it is, he is one whose personal acquaintance I should much like to make, to whom I should like to show my birds' eggs, with whom I should like to discuss (were it not for the waste of his valuable time) the notes, habits, and anatomy of every British bird. Now this writer, as a comparison, it seems, with my plain statements, tells some story of an acquaintance, who was not only romantically deceived and a

deceiver, but actually could not distinguish, by the mere sense of touch, the eggs of one of our *Columbidæ* from the eggs of one of our *Picidæ*. Can your readers swallow that, Sir? Then we have another correspondent, writing something about the incidence of solar rays upon the back of a Rook, making the latter look to him like a Wood Pigeon. Does he really believe that any naturalist has not observed that kind of phenomenon; the like of which, when the sun shines, you must have seen on almost any day on a slated roof? Can he, having gone to a museum, actually suppose that any sane man can have mistaken *Picus martius* flying at less than twenty yards distance toward the north-east of the observer, the sun being in the west, for any other bird? There is a good deal else of what I will dignify with the name of dust, not equalling rubbish, which a camel's-hair brush would sweep away in two or three strokes. I shall not use the brush, not simply because it would be a waste of my time, but because it would encroach upon your space.

As regards the forty eggs of the Wryneck, obtained from the same nest-hole, the offspring of the same mother, taken I believe in about forty consecutive days (see Bull's 'Birds of Herefordshire,' p. 97), I should mention that many of them were shown to me by the late J. Skyrme in his then valuable collection. The latest laid of them were extraordinarily small. I regret that I have no notes of measurement. These eggs ought to be, and probably are, existent somewhere. He gave me the account of how they were obtained; but this had been previously communicated to me by the experimenter, Dr. Powell, of Fawley Court, and the hole from which he had taken them was shown to me. I believe him to have been perfectly honest, and a careful observer. Anyhow the experiment was an old one, as I should have thought the critic ought to have known. Any of your readers, by making a series of such experiments, with patience, care as to hours, &c., will probably easily beat the record. I have seen something more surprising—a Song Thrush trying to sit on eighteen eggs. I know nothing about their parentage, but there was no mistaking the species of the parents. There was mud and clay all about the place, and there was no footprint of any human intriguer. Of the thirteen eggs which I removed, some were almost fresh; others had undergone incubation, not, I think, of more than five days.

* * * * *

What I have written about my own observations, I have written in simple honesty, well knowing that, like some sister virtues, honesty must be often for the present disbelieved. I appeal to one witness, who seems in no hurry to answer any bird-call, but who will probably answer it one day, *Picus martius* himself.

THE SOLWAY FISH HATCHERY.

EIGHT years ago Mr. J. J. Armistead, who had acquired extensive experience as a pisciculturist in the English Lake district and elsewhere, was led to establish a fish hatchery on the lands of Kinharvie, in the parish of New Abbey,—one of some half-dozen that exist in Scotland,—and the interesting and novel industry has flourished and grown apace in his skilful hands. To the untrained eye the site was a very unpromising one—for the most part a rush-covered meadow; but to the specialist it presented several important advantages. Most notable of these was the command of a water-supply not only constant and abundant, but of various quality, for the natural element of the fish is as diverse in its constituents and capabilities as the natural element of the plant. A water altogether admirable for hatching purposes may be totally unsuited for the rearing of plump fish, and *vice versâ*. With the Pow Burn on the one hand, and the Tannocks Burn and other small streams meandering through the wood on the other, and a copious and unfailing spring conveniently at hand, Mr. Armistead is able to make choice of the kinds best suited for his various experiments. The configuration of the ground is also favourable, permitting of the construction of a series of ponds at slightly differing levels, and thus facilitating the leading of the water-supply from the one to the other. In the course of the few years that Mr. Armistead has held it on lease—and during great part of which he laboured under the disadvantage of residence at Douglas Hall, fifteen miles distant—the appearance of the land has been greatly transformed, and if it does not yet quite “blossom as the rose,” it gives abundant promise of soon doing so. And now that he has acquired it by purchase from Lord Herries, we may expect the work of improvement and extension to receive a greater impetus from

"the magic of property." That the sense of security conferred by possession is exerting its natural influence was apparent on a recent visit, from the operations in progress and the plans which we learned are in contemplation.

The busiest season of the year at the fishery—the hatching time—is over. On the occasion of the writer's visit a comparatively few ova, taken from late fish, remained upon the grills, some being those of salmon; but a good many of the immature fry were still on hand. Here we see Nature not only assisted, but in part we may say superseded by art. The fish are spawned by hand, and the after stages of incubation and rearing the fry take place under artificial conditions. The hatchery proper is a long stone and lime building, fitted up with numerous narrow and shallow wooden boxes, through which there is kept up a constant circulation of the purest water. These are in the first instance filled with little grills, which are frames full of glass tubes, on which the ova is deposited, and as the season progresses they become the home of the fry in various stages of development. The naturalist has the opportunity of following the progress of the young life with the closest observation from the time that the first faint indication of vital form tinges the semi-transparent mass of the egg until the fish has emerged, appearing like a minute tail attached to a ball of disproportionate size, and until this ball or sac, with which Nature has provided for its sustenance during an infancy of three months, has been absorbed, and the tiny fish has become a feeding, self-supporting animal, ready, after several weeks of probationary training, to be set up in life on his own account. The boxes occupied by the fry present a very animated appearance, shoals of thousands reposing in a dark, inert-looking mass on the gravelly bottom; then suddenly dissolving into as many active, quick-darting atoms, when disturbed, or when attracted by the offer of food. It is in the fry stage, of course, that the greatest quantities are sent out from the fishery. This season quantities have been dispatched to all parts of the country, literally from Land's End to John o' Groats'. Ova is also supplied from the fishery in considerable quantities, consignments having been sent even to the Antipodes. For the transit of yearling fish zinc tanks are provided, of circular and tapering form, with a smaller inverted can on the top, filled with ice, the drip from which preserves an equal temperature in the

water below. These carriers, while extremely suitable for conveying yearlings, will not do for fry, which require water of a higher temperature, and these are all sent out in glass vessels specially made for the purpose, resembling carboys. The angle of the water with the glass has been duly considered, and when properly filled, a rotary motion is caused during transit, which is as a running stream to the little fish. Orders are less frequently received for larger fish, and only recently a consignment of fish averaging 2 lbs. each was despatched to a gentleman who wished to provide immediate sport. A large business is done in yearlings, which are made a special feature at the Solway Fishery.

The fish are reared in a series of ponds, many of them like broad trenches, others of larger dimensions and square in shape. The number permits of a perfect classification both as to species and age. The largest pond area at present immediately adjoins the hatchery and Mr. Armistead's residence; but a range of small ponds has been constructed on the crest of the rising ground at the further end of the field. It is intended to extend them along the whole face of the slope, and also to erect a second hatching-house in their vicinity. To secure a proper water-supply for this series of ponds has involved no small labour and outlay. The Pow Burn was tapped half-a-mile distant, a rough caul being thrown across it to dam it back at the place, and an aqueduct of that length has been constructed through the wood. Much of the cutting was through granite, and blasting had frequently to be resorted to. The work of pond construction has, however, been greatly facilitated by the retentive nature of the ground, which renders unnecessary the puddling or concreting of the bottom.

Gratifying, and in a measure surprising, results have been obtained in the cultivation of fish; not only larger individual specimens being reared than are to be met with under more strictly natural conditions, but gradual and constant improvement in their produce, and consequently in the general standard of the breed, being secured by the selection of ova only from perfectly healthy and well-grown fish. The Loch Leven Trout, the American Trout, the Windermere Char, and the Common Trout have received special attention at the hands of Mr. Armistead, and the most satisfactory results have attended his experiments with and careful rearing of them. A draught of the net in

any of the ponds brings to hand a sparkling mass of fine, healthy fish; among the older ones are a number of remarkable size. Perch, Tench, and other species are also reared; and there is a pond devoted to Gold-fish, with a small colony also of Leather Carp, reared from American fish. He has it in contemplation to try a series of experiments with our own Salmon, with a view to acclimatize it in the fresh water, and produce, as the Americans have done, a landlocked variety, which the owner of a pond or stream may always have at command.

Of course where so many fish are kept in a limited area they have to be artificially fed. Twice a day, and oftener in summer, animal food of various kinds is thrown to them; and on a warm day it is an animated sight to see the surface of the ponds all a-ripple and sparkling with bubbles caused by the continual leaping of their numerous tenants. Crustaceans and even Tadpoles reared "on the premises" go to supplement the hand-feeding in their season. A nursery of aquatic plants is also maintained for the sustenance of fish-life,

The situation of the fishery is somewhat remote,—two miles from the postal and telegraph station at New Abbey, and four from the railway, at Killywhan,—but an ample supply of good water and other facilities far more than compensate for this. The site, too, is a very pleasant one, under the shelter of the fine wood of larch and fir that stretches up towards Kinharvie House, with the New Abbey hills and the Waterloo monument in the background, and a fine view of Criffel and the Solway commanded by the climbing of a gentle eminence, whence the privileged visitor is sure to carry away the pleasantest memories of a personal kind.

NOTES AND QUERIES.

Death of Mr. Frederick Bond.—On the 10th August, at Staines, where he had resided for many years, our dear old friend Frederick Bond passed quietly and peacefully away, in the seventy-ninth year of his age. He will be much missed by everyone who knew him, but by none more than by the present generation of ornithologists and entomologists, to whom he was truly a guide, philosopher, and friend. When it is remembered that he helped to found 'The Zoologist,' in 1843, and contributed to its pages at intervals from that date to the present year (his last note, on the

Sand Grouse in Middlesex, having appeared in the month of June last), it will be evident that we have lost in him no ordinary supporter. His life-long experience as a field naturalist enabled him, when appealed to, to give most valuable information, and we feel sure that very many readers of this Journal will share the Editor's profound regret at his demise. A man who has done so much for British Zoology as the late Frederick Bond deserves more than a mere passing notice of his death, and we reserve for a future number a memoir of one whom it has been our privilege and pleasure to know for more than a quarter of a century. In preparing this tribute to his memory, we need scarcely say that we shall be grateful for any suggestions from friends, or for the communication of facts that might be usefully mentioned.

Destruction of Game and so-called Vermin.—All that is not "game" is "vermin," according to most keepers: both are destroyed, the one because it is "game," the other because it is "vermin," and what an enormous destruction of animal life is the result! During the shooting season of 1888 the following species were killed on the Austro-Hungarian crown lands of Salzburg:—294 Stags, 1505 Roe-deer, 1270 Chamois, 3562 Hares, 3 Marmots, 178 Capercailzie, 176 Black-game, 222 Hazel Grouse, 9 Ptarmigan, 471 Pheasants, 1237 Partridges, 40 Quail, 65 Snipe, 10 Woodcock, and 357 Wild Duck. Besides these there were destroyed 980 Foxes, 252 Martens, 72 Polecats, 9 Otters, 11 Wild Cats, 76 Badgers, 9 Eagles, 22 Owls, and 770 Hawks of various kinds. Years hence, when some of the wild creatures here mentioned will have become extinct, the above will be an interesting, though melancholy, record of man's propensity for destroying life.

BIRDS.

The Swannery at Abbotsbury.—This famous Swannery, of which an illustration is given in Mr. Mansel-Pleydell's 'Birds of Dorsetshire,' has been so often mentioned in 'The Zoologist' that readers will doubtless be interested to hear of a recent lawsuit concerning it, in which judgment was delivered by Mr. Justice Kekewich on the 10th August last. It was an action by the Earl of Ilchester, the owner and Lord of the Manor of Abbotsbury, in Dorsetshire, for an injunction to restrain the Defendants Rashleigh and others from trespassing on Chesil Bank and the Fleet, which were alleged to be part of the estate. It appeared that Chesil Bank united Portland with the mainland, and extended from Portland Roads in a north-westerly direction to Abbotsbury, where it joined the coast line. Between this bank and the coast there was a piece of water called the Fleet, extending from Portland Ferry Bridge to Abbotsbury, a distance of about nine miles. At Abbotsbury end there is a Swannery, which existed in Queen Elizabeth's time, and contained several hundred swans. The Plaintiff

claimed the land covered by the Fleet, the Chesil Bank, the wildfowl decoy, and the Swannery. On December 26th, 1887, the Defendants, who represented the fishermen on the coast, it was said, came up the Fleet in boats, penetrated into the Swannery, fired off guns, and made violent noises, which disturbed and frightened the birds, the result being that several flew away. The Plaintiff then brought this action simply to establish his right to the Swannery, the Fleet, and the Chesil Bank, but he had no intention to interfere with the fishing industry, and, in fact, he had conceded the right of the Defendants and other persons having lawful occasion to cross the Fleet in that part which was outside the Abbotsbury parish, and to use the eastern portion of Chesil Bank for hauling their boats, dragging their nets to shore, and drying them, &c.; but he objected to their navigating the Fleet west of Abbotsbury stone, where the Swannery was. The Defendants contended that they were entitled to use all parts of the bank and the Fleet, and that the Fleet was an arm of the sea, subject to the influx and reflux of the tide, and was navigable, and was therefore *jus publicum*, or public property: but, if that were not so, they had acquired the right to use it by custom. The Plaintiff contended, however, that the tide had no perceptible effect upon the water in the north-western portion of the Fleet, and it was not navigable, being only two feet deep and thick with weeds, and he denied the alleged custom, as watchmen had been constantly employed by him to warn off people who came up that portion of the Fleet. The Earl of Ilchester and several witnesses gave evidence in support of the Plaintiff's case, and a great deal of documentary evidence extending back to a distant period was adduced to show that the Fleet and the Chesil Bank was part of the Abbotsbury estate. On the part of the Defendants, evidence was given to the effect that they did not fire off guns or disturb the swans on the occasion mentioned, and they submitted that they had been accustomed to use all parts of the Chesil Bank for fishing operations, and to pass over the whole of the Fleet; that the Fleet was navigable; that it was influenced by the tides from end to end, and that therefore it was an arm of the sea and open to the use of the public. At the conclusion of the arguments, his Lordship reserved judgment. Subsequently, in giving judgment, he reviewed the evidence at length, and the numerous authorities bearing on the subject, and said that the action was brought by the Plaintiff to restrain the Defendants from trespassing on the Chesil Bank and the waters of the Fleet west of the Abbotsbury stone, which he claimed as his property. The Defendants contended, however, that it was an arm of the sea, and was subject to the ebb and flow of the tide, and, being navigable, the public had a right to use it. On that point, his Lordship drew attention to the fact that witnesses had been called who had stated that the western portion of the Fleet was dry land at some periods, and therefore it could not be said

to be navigable. As regards its being an arm of the sea and subject to the tides, he thought the scientific evidence showed it was not. If the depth of the water differed from time to time, it was caused by the streams that ran into it, and the percolation of the sea through the Chesil Bank. He came to the conclusion that the Plaintiff had made out his claim to the western portion of the Chesil Bank and the Fleet, and he must, therefore, restrain the Defendants from trespassing on the waters of the Fleet west of the Abbotsbury stone, and also the western portion of the Chesil Bank above high-water mark. He was glad to say that in granting the injunction he was not interfering with the fishing industry carried on by the Defendants. —Injunction accordingly against the Defendants, but without costs.

Crossbill breeding in Immature Plumage.—In replying to my note (p. 263), Mr. H. A. Macpherson tries (p. 313) to lure your readers away from the statement at issue. His point is this:—"The interesting point, of course, is to find the male *Loxia curvirostra* breeding in a yellow dress, and before assuming the red plumage of maturity." In the words italicised it is assumed by Mr. Macpherson that the young male Crossbill wears the yellow dress before acquiring the red dress, and that this yellow dress is immature, an assumption directly at variance with the opinions of the most careful observers. Here, first, is the admission or opinion of Professor Newton (Yarrell, 4th ed. ii. p. 200):—"By September the young cocks have lost much of the striped (*sic*) appearance, and at their moult begin to assume the red plumage of maturity," &c. This statement agrees fully with Mr. J. Hancock's observations, and it implies also that the red dress (or, as it may be styled, the marital dress) of the young males is donned at their first moult. Next, in the 'Ornithologie Européenne,' by Degland (vol. i. p. 177), are these words:—"Des jeunes mâles, tués le 15 Août près de Lille, étaient en mue, et offraient quelques plumes rouges sur les parties inférieures. A l'âge d'un an cette couleur est plus ou moins dominante." Admitting, also, the correctness of the observations recorded by Mr. Dresser ('Birds of Europe,' vol. iv. p. 128), that young males do sometimes moult directly into the yellow or greenish yellow dress, yet how, even with this admission, can the bird in the yellow dress observed by Mr. Ussher have been, as Mr. Macpherson says, in the immature plumage. But, as stated by Mr. J. Hancock ('Birds of Northumberland,' p. 50), male birds in the yellow dress have been observed breeding in the same locality with other pairs, the male being in a red dress. To suggest, as Mr. Macpherson quotes, that these yellow males are barren birds, without first having carefully examined the state of the sexual organs of freshly-killed specimens in the breeding season, is merely jumping at a conclusion, and is most probably as inaccurate as Mr. Macpherson's statement that the yellow dress is the dress of an immature male. But enough. The criticism about my use of the word "spotted" is perhaps best replied to by asking

what Latin word would Linnæus have used if he had had the chance of describing the young of the Common Crossbill in the first plumage? Would it have been *maculosus*, *lineatus*, or *striatus*? It satisfies me to think that he would have used the first of these three words. A spot may be of any shape, longitudinal, triangular, square, or irregular as in the Spotted Woodpeckers. "Obsolete heresy" is something I cannot comprehend, but in the present state of our knowledge the word "heresy" is a term that ought not to be used by searchers after or lovers of truth. Let the word and its associations be "obsolete."—RICHARD HOWSE (Museum, Newcastle-on-Tyne).

Food of the Shearwater.—Some little time ago the writer described in 'The Zoologist' (1888, p. 374), how he had seen Shearwaters, *Puffinus anglorum*, feeding on small fishes, in company with Herring Gulls, *Larus argentatus*, a circumstance in keeping with the fact that he had found the digested remains of fish in the stomachs of some of these birds killed on land. Mr. Gawen, however, expressed the opinion (*tom. cit.* p. 426) that the birds in question had swallowed "fish offal." Mr. R. Warren then (p. 470) added the weight of his experience to that of the writer, who, rather than press his views unduly, preferred to wait for further evidence. This has now been obtained. An example of *P. anglorum*, shot in his presence by Mr. F. P. Johnson, proved to contain only the remains of fishes, so small that they could not have been taken in any net but a muslin one. The bird in question was one of a flock which had been observed for some days, and the observers, both of whom have studied *P. anglorum* for eight or nine summers, felt satisfied that its companions were fishing in the same way. There is no evidence, so far, that anyone has ever seen a Shearwater swallow a fish. Under ordinary circumstances, they certainly catch their prey on the wing, as Terns do, and their movements are too rapid to allow an observer to detect their seizing their prey, to say nothing of the fact that they almost always fish in a breeze where the water is a little ruffled. All through the long summer days their beautiful evolutions may be studied within the Inner Hebrides, and at nightfall their weird cries resound across the water.—H. A. MACPHERSON (Carlisle).

Sand Grouse in Nottinghamshire.—The flock of seventy or more Sand Grouse which arrived here during the last week in April, 1888, remained until the end of October, when they left, and have not returned. Every care was taken of them, and as the ground suited them in every way, one would have thought they would have remained here. One pair nested, and two eggs were taken. Though this has been mentioned in 'The Field,' I think a notice should appear in 'The Zoologist.' In addition to this flock, four other lots were seen in different parts of the county.—J. WHITAKER (Rainworth, Notts).

Conviction under the Wild Birds Protection Act.—The Society for the Protection of Birds during the Close Season has made a start and

obtained a conviction at Newmarket, against a man named Fenn, of Isleham. The Society's officer, in July last, went to the premises of this birdcatcher, and there found huddled together, in all the dirty misery it was possible for them to be in, Blackbirds, Thrushes, Linnets, Plovers, and other birds, all of which had been recently captured during the close time. The man was convicted and fined 15s. It is to be hoped that the conviction will operate beneficially, and the law may continue to be enforced by the Society, of which we should be glad to hear more.

Golden Oriole in Derbyshire.—A beautiful male specimen of this bird was shot just over the county boundary at Creswell, Derbyshire, on May 13th. Why will not people observe the Wild Birds Protection Act, and give this and other beautiful birds a chance to stay and nest here?—J. WHITAKER (Rainworth, Notts).

Great Crested Grebe breeding in Scotland.—I have this year discovered in the South of Scotland the nest and eggs of the Great Crested Grebe, *Podiceps cristatus*. As I am not aware that this bird has been recorded to breed in Scotland, a note of the occurrence may be of interest.—ROBERT H. READ (Cutheart, Glasgow).

[Selby states (ii. p. 394) that this bird breeds on a few of the *northern* Scottish lakes, but does not specify any locality. This is not confirmed by Messrs. Harvie Brown and Buckley (p. 245), and Robert Gray, in his 'Birds of the West of Scotland' (p. 405), adds nothing to this bare statement.—ED.]

REPTILES.

Addendum to the List of Reptiles found in Barbados.—In the August number of 'The Zoologist' (pp. 295—298) is published a list of the terrestrial reptiles of the island of Barbados, in which I stated that only one species of snake is found there. This statement has now to be modified. Mr. G. A. Boulenger, on examining the small collection of reptiles from Barbados that I submitted to him, reported that it only contained one species of snake, *Liophis perfuscus*, Cope. I was then under the impression that Mr. Boulenger had seen all the reptiles collected by me in Barbados; but, through an oversight on my part, another small snake had got astray amongst some bottles containing Barbados mammals. This specimen has since been handed over to Mr. Boulenger, who identifies it as *Stenostoma bilineatum*, Schleg., hitherto known from Martinique and Guadeloupe. Mr. Boulenger remarks in a letter to me that the habits of the *Stenostomatidae* being very much those of earthworms, they may easily be transported in mould. This little snake is certainly very rare in Barbados; but its existence is known to some of the planters, for Mr. T. E. N. Dean, of St. Nicholas, mentioned to me that there was a second species of snake or slow-worm found in the island,—black, and a few inches long,—generally under heaps of decayed leaves or litter, and that the coloured people call it

the "Seven-year Snake," as he or she who kills such a one is supposed to obtain remission of sins for a like period! When I obtained a specimen of this little reptile in Barbados I thought it was a second species of snake, and remained under that impression until my collection had been critically examined, when it proved, so far, only to contain one species, and I wrote accordingly (*vide antea*, p. 296). I have now to modify that statement, and to express my regret that carelessness on my part caused the omission of *Stenostoma bilineatum* from my list of Barbadian reptiles.—H. W. FEILDEN (West House, Wells, Norfolk).

FISHES.

Greater Flying-fish off the Cornish Coast.—During the second week of July last the crew of a fishing-boat, the 'Little Gleaner,' when ten or twelve miles off the Lizard, on drawing their mackerel-nets, found a Flying-fish, *Exocetus volitans*, Day, entangled in the meshes. It measured 14½ inches in length, and was in good condition.—MATTHIAS DUNN (Mevagissey, Cornwall).

MOLLUSCA.

Mollusca of Stourport and District.—The following list of species taken by me last Whitsuntide at Stourport, may form an interesting addendum to what is already known concerning the molluscan fauna of Worcestershire:—*Limnæa glabra* (Müll.), very plentiful in a ditch on Hartlebury Common; some very large specimens also in a ditch in a field on the Severn side belonging to the Coney Green Farm. *Planorbis spirorbis* (Müll.), in the same ditch on Hartlebury Common, and also in Hillage Pool. Out of Hillage Pool I also took *L. peregra* (Müll.), with its vars. *ovata* (Drap.) and *labiosa* (Jeff.), *Bythinia tentaculata* (Linn.), *B. leachii* (Shepp.), *Valvata piscinalis* (Müll.), *Ancylus oblongus* (Lightfoot), *Planorbis umbilicatus* (Müll.), *P. carinatus* (Müll.), *P. vortex* (Linn.). *Limnæa palustris* (Müll.), *Sphærium corneum* (Linn.), *Anodonta anatina* (Linn.), and *Unio tumidus* (Phillippson). *Succinea elegans* (Risso) and *S. Pfeifferi* (Rossm.) were common on the sedges round the pool. Typical specimens of *Helix arbustorum* (Linn.), with vars. *pallida* (Taylor) and *marmorata* (Poff.) were common at Lincombe Bay, and on a nettle-covered bank at the base of Stagbury Hill. At Lincombe Bay I also took fine examples of *Succinea putris* (Linn.) and *S. elegans* (Risso), which were living on the nettles near the Severn in company with *Helix sericea* (Müll.), *H. hispida* (Linn.), *H. rufescens* (Penn), *H. rotundata* (Müll.), *Helix nemoralis* var. *carnea* (Roeb. and Taylor), with band-formulæ of 00300 and 123(45), *Helix hortensis* var. *lutea* (Moq.), with band-formulæ of 00000, 12345, 123(45), and var. *albina* (Moq.), with band-formulæ of (12345), 12345, 1(234)5, *Hyalinia cellaria* (Müll.), *H. alliaria* (Müll.), *Clausilia rugosa* (Drap.), and *Cochlicopa lubrica* (Müll.). In the "Deep Meadow" near the Severn at Stourport I found *Succinea putris* (Linn.), *S. elegans* (Risso), *Arion subfuscus*

(Drap.), *Limax levis* (Müll.), *Hyalinia fulva* (Müll.), *H. nitida* (Müll.), *Physa hypnorum* (Linn.), and *Carychium minimum* (Müll.). In my note on "Shells round London" (p. 270), *Arion ater* var. *brunnea* (Lehm.) should have been *Arion ater* var. *brunnea* (Roebuck).—JOSEPH W. WILLIAMS (Mitton, Stourport).

SCIENTIFIC SOCIETIES.

ZOOLOGICAL SOCIETY OF LONDON.

June 18, 1889.—Prof. FLOWER, C.B., LL.D., F.R.S., President, in the chair.

The Secretary exhibited (on behalf of Mr. J. F. Green) a very fine example of the Common Eel, obtained from a pond in Kent, and measuring upwards of four feet in length.

Mr. B. B. Woodward exhibited and made remarks on a drawing representing a living example of *Ærope kaffra*, a carnivorous snail from the Cape Colony. Mr. Woodward also exhibited an example of a fossil shell from the Eocene of the Paris Basin (*Neritina schmideliana*), and a section of it showing the peculiar mode of its growth.

Mr. Eadward Muybridge, of the University, Pennsylvania, exhibited a series of projections by the oxyhydrogen light, illustrative of the consecutive phases of movements by various quadrupeds while walking, trotting, galloping, &c., and of birds while flying.

A communication was read from Professor Giglioli, containing the description of a new genus and species of Pelagic Ganoid fish from the Mediterranean, proposed to be called *Eretmophorus kleinbergi*.

Lieut.-Col. H. H. Godwin-Austen read the first of a proposed series of papers descriptive of the land-shells collected in Borneo by Mr. A. Everett, with the descriptions of new species. The present paper treated of the *Cyclostomaceæ*.

Capt. G. E. Shelley read a list of birds collected by Mr. H. G. V. Hunter in Masai-land during the months of June, July, and August, 1888. The collection (which Mr. Hunter had presented to the British Museum) consisted of examples of ninety-four species, seven of which were described by the author as new to science.

Mr. P. L. Sclater gave a further description of Hunter's Antelope, *Damalis hunteri*, from specimens obtained by Mr. H. C. V. Hunter on the river Tana, Eastern Africa.

Mr. F. E. Beddard read a paper on the freshwater and terrestrial Annelids of New Zealand, with preliminary descriptions of new species.

A communication was read from Mr. H. W. Bates, containing descriptions of some new genera and species of Coleopterous insects collected by

Mr. Whitehead during his recent visit to Kina Balu. The collection was stated to comprise an unusual proportion of new and remarkable forms.

This meeting closed the session.—P. L. SCLATER, *Secretary*.

ENTOMOLOGICAL SOCIETY OF LONDON.

August 7, 1889.—The Right Hon. Lord WALSINGHAM, M.A., F.R.S., President, in the chair.

The Rev. John Walley, of Wuhu, China, was elected a Fellow; Professor Charles V. Riley, of Washington, United States, was elected an Honorary Fellow in place of the late Dr. Signoret, of Paris; and Colonel Swinhoe and the Rev. F. D. Morrice were admitted into the Society.

Mr. Walter F. Blandford exhibited a specimen of *Cardiophorus cinereus*, Herbst, taken at Tenby, and remarked that the species had rarely, if ever, previously been found in the United Kingdom. Mr. C. O. Waterhouse said he believed that there was a specimen in the collection of his late father and also another specimen in the collection of the British Museum.

Mr. Waterhouse stated that the British Museum had just received from the Rev. Arthur Elwin, of Hangchow, China, a luminous larva about $1\frac{1}{2}$ in. long and $3\frac{1}{2}$ lines broad, which he believed to be one of the *Lampyridæ*.

Lord Walsingham exhibited specimens of *Conchylis degreyana*, M'Lach., bred from seed-heads of *Plantago lanceolata* at Merton, Norfolk; also a specimen of *Tineidæ* allied to the genus *Solenobia*, probably belonging to *Dissoctena*, Staud., but differing somewhat in the structure of the antennæ. Lord Walsingham remarked that the specimen was taken by himself at Merton on the 31st July last, and that the species was apparently undescribed.

Mr. Meyer-Darcis exhibited a collection of Coleoptera, comprising specimens of a species of *Loethrus* from Turkestan; *Julodis globithorax*, Stev., from the Caucasus; a new species of *Julodis* from Kurdistan; *Cardiaspis Mouhotii*, Saunders, from Sikkim; *Carabus smaragdinus*, Fisch., from Siberia; *Julodis ampliata*, Mars., from Aintab, Asia Minor, and a variety of the same from Kurdistan; and *Julodis luteogramma*, Mars., from Syria, and a variety of the same from Kurdistan.

Mr. H. Goss read extracts from letters from Mr. R. W. Fereday, of New Zealand, and Sir John Hall, K.C.M.G., relating to a number of Lepidoptera collected recently at sea, about half way between the River Plate and Rio, at a distance of over 250 miles from land, in about 30° S. lat. and 46° W. longitude. It was stated that the ship was surrounded by swarms of moths. Mr. J. J. Walker, R.N., observed that he had seen a large number of insects at sea about 150 miles off the coast of Brazil, and he referred to other records of the capture of insects at sea in Darwin's 'Voyage of the Beagle,' and Dr. Copping's 'Cruise of the Alert.' The discussion was continued by Dr. Sharp, Lord Walsingham, Mr. White, Mr. Kirby, and others.

Mr. E. Meyrick read a paper entitled "On some Lepidoptera from New Guinea," and exhibited the species therein described. He stated that the specimens were derived from two sources, *viz.* (1), a portion of the collection received by the Society from Baron Ferdinand von Müller, F.R.S., and collected by Mr. Sayer when accompanying the Australian Geographical Society's Exploring Expedition; and (2), a number of specimens collected by Mr. Kowald near Port Moresby, and obtained from him by Lord Walsingham.

Mr. Blandford read a letter from Mr. Wroughton, of Poona, Deputy Conservator of Forests, asking for assistance in working out certain Indian Hymenoptera and Diptera in the collections of the Bombay Natural History Society. Lord Walsingham, Colonel Swinhoe, and Mr. Moore made some remarks on the subject.—H. Goss, *Hon. Secretary*.

NOTICES OF NEW BOOKS.

Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum (Natural History). By OLDFIELD THOMAS. 8vo, pp. 400, Plates I.—XXVIII. Printed by order of the Trustees.

Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (Natural History). New Edition. By G. A. BOULENGER. 8vo, pp. 311, Plates I.—VII. Printed by order of the Trustees.

It is highly satisfactory to mark the steady progress which is being made in the preparation of the Catalogues of the Zoological Collections in the British Museum, and the important additions which are being constantly made in almost every branch of Zoology.

Since the year 1843, when the late Dr. Gray brought out his 'List of Mammalia in the Collection of the British Museum,' no general account of the Marsupials in that collection has been published, whilst nearly all the other Orders of the Class have been made the subjects of continuous study and revision. This seeming neglect, as explained by Dr. Günther in the Preface to the above first-mentioned Catalogue, was chiefly due to the appearance in 1846 of two works, *viz.*, Waterhouse's standard work on these Mammals, which in the course of the following

twelve years was supplemented by Gould's 'Mammals of Australia.' Both these works had a direct relation to the collection in the British Museum, and for many years seemed fully to satisfy the needs of zoologists. The collection, however, grew apace like that of the other Mammalia, no opportunity being lost of making such additions as were required to complete the series, and the number of specimens appear now—after the lapse of some forty years—to be about trebled. Especially in the course of the last three or four years, during which time the 'Catalogue of the Marsupialia' has been in progress, the collection, chiefly through the efforts of Mr. Thomas, has received many important additions.

The specimens now enumerated amount to 1240 Marsupials and 64 Monotremes, making 1304 in all. Of this total, 173 are preserved whole in spirits, while the osteological collection of skeletons and skulls amounts to 703. Apart from the mere number of specimens, however, as the value of zoological collections depends so largely upon the possession of types, it is important to note that in the Marsupialia and Monotremata alone the British Museum possesses more type specimens than all the Continental Museums put together. Here are the figures:—British Museum, 74; Paris, 21; Leyden, 8; Genoa, 7; Christiania, 5; Vienna, 4; Berlin, 3; Munich and Copenhagen possessing only one each. This wealth of types is, no doubt, in a great measure due to the possession of the late Mr. Gould's collection of Australian mammals (which contained not only a complete set of the types of the many species described by him, but also a fine series of all the Australian mammals he obtained) and the collections of Sir George Grey, from South Australia, and Mr. Ronald Gunn, from Tasmania.

From this it will be seen that, in the preparation of the Catalogue before us, Mr. Thomas has had much valuable material upon which to work,—material which he has taken care to supplement by visiting the principal Continental Museums for the purpose of examining the types there, and other important specimens in these two Orders of mammals. The result is a very valuable Catalogue, useful not merely as an enumeration of what may be found in the National Museum, but because it embodies double synopses of the genera and species of the Marsupialia and Monotremata which will enable students to

identify specimens either from their external characters or from the skulls alone. The introductory remarks on dentition, and upon the method of measurement adopted by the author, are well considered, and deserve careful perusal.

In striking contrast with what has occurred in other groups of Vertebrates, the increase of known species of Chelonians, says Mr. Boulenger, "has been very slight within the last twenty years." In fact Mr. Boulenger's Catalogue contains a much smaller number of species than did the late Dr. Gray's 'Supplement' to his 'Catalogue of Shield Reptiles,' published in 1870. This, no doubt, is due to the different views held by the writers as to what ought to constitute specific characters, and partly also to a better understanding at the present day of the amount of variation to be found within given forms.

In the volume before us, with the title above given, we find a complete revision of both higher and lower groups, the synonymy carefully worked out, clear synopses given of the genera and species, with half-a-dozen well-executed plates and numerous woodcuts. It need scarcely be said that, embodying, as it does, the most recent views of classification and nomenclature, this volume will of necessity supersede all previous Catalogues of the Chelonians and Crocodiles which have emanated from the British Museum.

A Catalogue of Canadian Birds; with Notes on the Distribution of the Species. By MONTAGUE CHAMBERLAIN. Sm. 4to, pp. 143. St. John, N.B. (McMillan, 98, Prince William Street).

A Systematic Table of Canadian Birds. By MONTAGUE CHAMBERLAIN. Large 4to, pp. 14. St. John, N.B. (same publisher). 1888.

ALTHOUGH neither of these works can be accurately described as "new books," having lain for some months on our table, we have no doubt that they will be "new" to many of our readers, and some allowance may be made for the delay in noticing them on the ground of foreign publication, which generally implies delay in transit.

Some authoritative work on the Birds of Canada has long been wanted, the very few volumes hitherto published on the

subject being quite unimportant and not very trustworthy, the best perhaps being Mr. McIlwraith's 'Birds of Ontario.' Canada, in fact, has done nothing hitherto for Ornithology, and even the Reports of the Geological Survey do not help us in this direction. While we know in a general way what species occur there, and something of their distribution, many problems of much interest in relation to North American birds can only be settled satisfactorily by means of extensive field-work and large series of specimens collected in the great regions north of the United States. It is to be hoped, and indeed expected, that for this research Mr. Chamberlain's book will pave the way. He has furnished a carefully prepared Catalogue of such birds as are known with certainty to occur in Canada, and although for the sake of brevity he has omitted all synonyms, and even descriptions of species, some useful notes are given upon nearly every bird mentioned. We are not sure that it was wise to omit descriptions of size and general coloration, which might be very briefly noted, for, although assuredly such information is to be found in many excellent text-books on North American birds, travellers and collectors as a rule are not disposed to carry many books about with them, and to find what they want in a handy volume—say double the size of Mr. Chamberlain's Catalogue—would be a great boon.

The object of the present work, as stated by the author in his Preface, is to bring together the names of all the birds that have been discovered within the boundaries of the Dominion, from the Atlantic to the Pacific, and north to the Arctic Ocean; to present these in the system of nomenclature and in the sequence now generally adopted by American ornithologists, and to give (briefly) the geographical distribution of each species.

The book is nicely and clearly printed on good paper, and is a decidedly welcome addition to ornithological literature.

In the 'Systematic Table of Canadian Birds,' by the same author, printed on larger paper, and on one side of the page only, we are enabled to see at a glance the exact position which any given species occupies in the scheme of classification, the headings of the columns—which extend across a very wide page—being "Family," "Subfamily," "Genus," "Subgenus," "Species," "Subspecies" (if any), and "English Name." The sportsman, for example, who may desire to know what "game

birds" are to be met with in Canada, will find a list of them—twenty in number—on page 6; and the wildfowler may see at a glance, on page 3, what ducks, geese, and swans are likely to reward his search along the coast or on the inland waters. Thirty-five different kinds of Ducks, a dozen different Geese, and two species of Wild Swan, ought to tempt many an English sportsman to try Canadian waters.

Report on Bird Migration in the Mississippi Valley in the years 1884 and 1885. By W. W. COOKE. Edited and revised by Dr. C. HART MERRIAM. 8vo, pp. 313, and Map. Washington, 1888.

THE present Report, which has been prepared by Prof. W. W. Cooke, with the assistance of Mr. Otto Widmann and Prof. D. E. Lantz, is the first fruit of the co-operative labours of the Division of Economic Ornithology of the Department of Agriculture and the Committee on Bird Migration of the American Ornithologists' Union. It consists of two parts: (1) an introductory portion, treating of the history and methods of the work, together with a general study of the subject of Bird Migration, including the influence of the weather upon the movements of birds, the progression of bird-waves and causes affecting the same, the influence of topography and altitude upon migration, and the rates of flight in the various species; and (2) a systematic portion, in which the five hundred and sixty species of birds known to occur in the Mississippi Valley are treated serially, the movements of each during the seasons of 1884 and 1885 being traced with as much exactness as the records furnished by the one hundred and seventy observers in the district permit.

The chapters entitled "The Relation of Migration to Barometric Pressure and Temperature," and "A Study of the Bird-waves which passed up the Mississippi Valley during the Spring of 1884," are worthy of the most careful perusal; and the articles on the Kingbird and Purple Martin, in the systematic portion of the Report, are particularly instructive. Indeed we feel no hesitation in expressing the belief that the present Report is one of the most valuable contributions ever made to the subject of Bird Migration.

